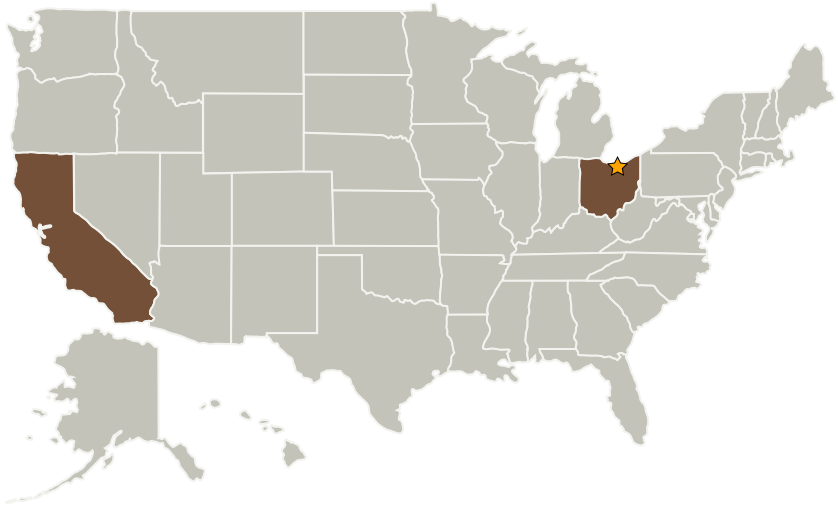
Hubless Flywheel with Null-E Magnetic Bearings, Phase I

Completed Technology Project (2004 - 2005)

Project Introduction

For space-born energy storage systems, the energy to weight ratio is extremely important. From this perspective, a hubless flywheel energy storage design is very advantageous since most of the flywheel energy is stored in its outer circumference, while the core significantly adds to the system weight. One of the problems with this design is that conventional active magnetic bearings are difficult to integrate into the overall system. We propose to utilize recently developed Null-E Magnetic Bearings instead, which appear to be better suited for the hubless topology. Their major advantages over active magnetic bearings include inherent stability at high rotational speeds, simplicity, low cost and lack of laminated components. At the same time, Null-E bearings deliver the desired combination of high load capacity, stiffness and low rotational losses. They can be designed to operate as entirely passive systems with no electronics or external power supplies, or as partially active systems, with some supplementary electronics. A combination of different modes is also possible, e.g. an active system at low speeds and passive at high. The proposed study includes electromagnetic design and analysis of Null-E bearings as well as research of composite material technologies suitable for the proposed design.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Calnetix, Inc.	Supporting Organization	Industry	Cerritos, California

Primary U.S. Work Locations	
California	Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Patrick Mcmullen

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.2 Energy Storage
    - TX03.2.3 Advanced Concepts for Energy Storage